REMARKS/ARGUMENTS

Claims 1-12, 16, 17, 21, and 22 are canceled without prejudice. Claims 13, 18, and 20 are amended. New claims 23-40 are added. Claims 13-15, 18-20, and 23-40 are pending in the application. Reexamination and reconsideration of the application, as amended, are respectfully requested.

An object of the present invention is to provide a dry etching method that makes it possible to form textures efficiently and homogenously on the surface of a substrate, for example, a silicon substrate used in a solar cell. Another object of the present invention is to provide a dry etching method and a cleaning method adopted in the dry etching method, making it easier to clean a plate covering the surface of a substrate during etching.

CLAIM REJECTIONS UNDER 35 U.S.C. §102:

Claim 13 stands rejected under 35 U.S.C. §102(b) as being anticipated by Hed (U.S. Patent No. 5,171,732). Applicant respectfully traverses this opinion. Claim 13, as amended, is as follows:

> A dry etching method for forming fine textures on a surface of a substrate to be etched, said dry etching method comprising:
>
> placing a substrate to be etched inside a chamber; and
>
> covering said substrate to be etched with a plate,
>
> wherein said plate comprises an obstacle with a pluralilty of obstacle forming members that inhibit a part of gas and plasma from passing through said plate.

Applicant respectfully submits that Hed cannot anticipate amended claim 13 because Hed fails to teach the use of a plate which "comprises an obstacle with a plurality of obstacle forming members that inhibit a part of gas and plasma from passing through said plate." Hed teaches the use of various screens to cover a

substrate, having either a discrete rectangular or round opening or being in the shape of a ring. (column 8, lines 23-37). In contrast, the bands of material in said obstacle of the present invention allow for openings across the entire surface to be etched. In addition, claim 13 was clarified to indicate that the obstacle has a plurality of obstacle forming members. This in turn allows for homogeneous etching of a texture across the entire substrate surface. (Applicant's specification at p. 14 lines 9-14; p. 15 lines 10-13).

In light of the foregoing, Applicant respectfully submits that Hed could not have anticipated or rendered obvious claim 13, because Hed fails to teach or suggest each and every claim limitation. Withdrawal of this rejection is thus respectfully requested.

Claims 18 and 19 stands rejected under 35 U.S.C. §102(b) as being anticipated by Hed (U.S. Patent No. 5,171,732). Claim 18, as amended, is as follows:

> A dry etching method, comprising:
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> placing a substrate to be etched inside a chamber; and
>
> covering said substrate to be etched with a plate provided with a number of opening portions,
>
> wherein fine textures are formed on a surface of said substrate to be etched and said plate is cleaned on a surface side concurrently.

Applicant respectfully submits that Hed cannot anticipate claim 18 because Hed fails to teach a method of etching "wherein fine textures are formed on a surface of said substrate to be etched and said plate is cleaned on a surface side concurrently." Hed teaches only the use of a screen with a pinhole perforation to etch a small hole in a diamond-like carbon substrate. (column 10, lines 3-9). Nothing in Hed teaches the formation of fine textures on the surface of the etched substrate, and the purpose of etching in Hed is simply to remove excess substrate.

(column 10, lines 23-28). Hed teaches that the screen can be removed when etching is complete (column 10, lines 23-28), but nothing in Hed teaches or suggests that the screen is concurrently cleaned during etching.

In light of the foregoing, Applicant respectfully submits that Hed could not have anticipated or rendered obvious claim 18, because Hed fails to teach or suggest each and every claim limitation.

Claim 19 depends from claim 18, and cannot be anticipated or made obvious for at least the same reasons as claim 18. Withdrawal of this rejection is thus respectfully requested.

CLAIM REJECTIONS UNDER 35 U.S.C. §103 :

Claims 13-15 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Obszarny (U.S. Patent 6,176,967) in view of prior art admitted in Applicant's specification pages 3-4. The Applicant respectfully traverses this rejection. Claim 13, as amended, is as follows:

> A dry etching method for forming fine textures on a surface of a substrate to be etched, said dry etching method comprising:
>
> placing a substrate to be etched inside a chamber; and
>
> covering said substrate to be etched with a plate,
>
> wherein said plate comprises an obstacle with a pluralilty of obstacle forming members that inhibit a part of gas and plasma from passing through said plate.

The Office argues that Obszarny teaches the use of reactive ions in conjunction with shielding masks to etch a substrate, and that the admitted prior art teaches the method of etching with a substrate placed on an RF electrode.

In response, Applicant respectfully submits that the cited references cannot render claim 13 obvious, because the cited references fail to teach or suggest the use

of a plate which "comprises an obstacle with a plurality of obstacle forming members that inhibit a part of gas and plasma from passing through said plate." Obszarny teaches the use of reactive ion etching of selected portions of a semiconductor wafer using rotating shields that have discrete windows. (column 3, lines 17-28). This serves to create semiconductor wafers that have multiple cuts which reflect the shape of the windows. (column 3, lines 37-43). Consequently, Obszarny fails to teach or suggest the discovery of the present invention, which is that the bands of material in said obstacle allow for openings across the entire surface to be etched. In addition, as discussed above, claim 13 was clarified to indicate that the obstacle has a plurality of obstacle forming members. This in turn allows for homogeneous etching of a texture across the entire substrate surface. (Applicant's specification at p. 14 lines 9-14; p. 15 lines 10-13). The present invention provides a method to etch a homogeneous texture across the substrate. (Applicants's specification at p. 20, lines 18-24). This discovery makes it possible to efficiently form substrates to be used in solar cells. (Applicant's specification at p.4 lines 21-25).

In light of the foregoing, Applicant respectfully submits that Obszarny and the admitted prior art could not have made claim 13 obvious, because the combination fails to teach or suggest every claim limitation.

Claims 14 and 15 depend from claim 13 and cannot be made obvious for at least the same reasons as claim 13. Withdrawal of these rejections is thus respectfully requested.

Claims 18-20 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Obszarny (U.S. Patent 6,176,967) in view of prior art admitted in Applicant's specification pages 3-4. The Applicant respectfully traverses this rejection. Claim 18, as amended, is as follows:

A dry etching method, comprising:

placing a substrate to be etched inside a chamber; and

covering said substrate to be etched with a plate provided with a number of opening portions,

wherein fine textures are formed on a surface of said substrate to be etched and said plate is cleaned on a surface side concurrently.

The Office argues that Obszarny teaches the use of reactive ions in conjunction with shielding masks to etch a substrate, and argues that the cleaning of the mask is inherent to the method. The Office further argues that the admitted prior art teaches the method of etching with a substrate placed on an RF electrode.

In response, Applicant respectfully submits that Obszarny fails to teach the etching of fine textures on a substrate and the concurrent cleaning of a plate used in the formation of said textures. Obszarny is directed to the use of reactive ion etching of selected portions of a semiconductor wafer using rotating shields that have discrete windows. (column 3, lines 17-28). This serves to efficiently create semiconductor wafers that have multiple discrete cuts. (column 3, lines 37-43). The admitted prior art suggests that etching can be performed while the substrate to be etched is resting on an RF electrode. Consequently, nothing in Obszarny or the prior admitted art teaches or suggests the discovery of the present invention, which is that a fine texture can be efficiently etched into a substrate for use in such devices as solar panels by etching with a plate that can be cleaned concurrently during the etching process. Obszarny simply does not teach etching of fine textures.

Applicant respectfully submits that the Office has failed to establish a prima facie case of obviousness because the Office has failed to provide support for its statement that the cleaning of the mask used in etching in Obszarny is inherent to Obszarny's method. Nothing in Obszarny discusses cleaning of a mask, or the binding of particles to a mask during etching.

Furthermore, Applicant has demonstrated the criticality of concurrent cleaning. During etching, etching residues attach to the plate covering the substrate to be etched. When etching is performed repetitively, these residues may accrue to such a point as they fall off the plate and onto the substrate to be etched. This forms an unwanted residue mask on the substrate, which interferes with the homogeneity of the textures that are etched on the substrate. (Applicant's specification p.6 line 23 – p.7 line 9). It is therefore necessary for efficient etching in the Applicant's invention that the plate be cleaned concurrently during etching. This is not the case for the invention of Obszarny, which does not focus on the etching of fine textures.

In light of the foregoing, Applicant respectfully submits that Obszarny could not have made claim 18 obvious in light of the prior admitted art, because the combination fails to teach or suggest each and every claim limitation.

Claims 19 and 20 depend from claim 18 and cannot be made obvious for at least the same reasons as claim 18. Withdrawal of these rejections is thus respectfully requested.

Claim 20 stands independently rejected under 35 U.S.C. §103(a) as being unpatentable over Obszarny (U.S. Patent 6,176,967) in view of prior art admitted in Applicant's specification pages 3-4 and in view of Kamman (U.S. Patent 4,681,780). Applicant respectfully traverses this rejection. Claim 20, as amended, is as follows:

> The dry etching method according to Claim 18, wherein a substrate to be etched next is placed inside a chamber, with said plate positioned such that a surface and a back surface are reversed after said plate is cleaned on the surface side, and fine textures are formed on a surface of said substrate to be etched next.

The Office argues that Kamman teaches simultaneous cleaning of deposits from a shadow mask used in processing a substrate, and that it would have been obvious to incorporate Kamman's cleaning method into Obszarny's process.

In response, Applicant respectfully submits that Kamman fails to teach or suggest an etching method "with said plate positioned such that a surface and back surface are reversed after said plate is cleaned on the surface side, and fine textures are formed on a surface of said substrate to be etched next." Kamman is directed towards the use of cylindrical rotary masks for depositing coating materials. (Column 3, lines 47-50). The masks are concurrently cleaned in another chamber by being rotated through a cleaning means that may be an ion beam. (Column 4, lines 19-23). Kamman thus differs from the present invention in that the masks used are cylindrical, that the masks are used for coating instead of etching, and the masks are cleaned in a chamber separate from that in which they are used. In the present invention, the cleaning process is performed on a plate that is itself in the etching chamber and is concurrently being used for etching fine textures on a substrate. The cleaning process of Kamman, therefore, could not be applied to the present invention. Nothing in Kamman teaches or suggests a cleaning process that could be applied to the present invention, and nothing in the combination Kamman, Obszarny, or the prior admitted art teaches a dry etching method that produces fine textures on a substrate while a plate used in etching is concurrently cleaned.

In light of the foregoing, Applicant respectfully submits that Obszarny could not have made claim 20 obvious in light of Kamman and in light of the prior admitted art, because the combination fails to teach or suggest each and every claim limitation. Withdrawal of this rejection is thus respectfully requested.

The art made of record but not relied upon by the Examiner has been considered. However, it is submitted that this art neither describes nor suggests the presently claimed invention.

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance. Reexamination and reconsideration of the application, as amended, are requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles, California telephone number (213) 337-6810 to discuss the steps necessary for placing the application in condition for allowance.

If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,
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